

very high speed DSL service to customers who are very close to the CO and lower speed service for customers who are not too close, assuming that the corresponding line is proven to have weaker interaction with other lines in the network.

Remark 5: A similar idea can be used to minimize far end crosstalk (FEXT) effect in the relatively short lines or where FEXT affects the received signal. However, the effect of NEXT is usually dominant in lines longer than 1000 *ft*.

CLAIMS

What is claimed is:

1. The idea of sharing a phone line (twisted pair) with more than one customer.
2. The idea of assigning lines to DSL customers in the network, independently of lines assigned to the POTS service of the corresponding customers.
3. Using the idea of claim 1 to increase the number of available lines for the customers of fat-pipe technology.
4. Using the ideas of claim 1 and claim 2 to improve the performance of the DSL network by reducing the effect of crosscoupling noise in the network and increasing the SNR of the DSL services.
5. Using the idea of claim 1 and claim 2 to solve any given optimization problem, such as the problem of minimizing the weighted sum of the energy of the crosscoupling between lines in the network or any other performance index, by finding the telephone lines that have minimum interaction with each other in the network and assigning them to the DSL services.
6. Using the optimization problem of claim 5 to improve SNR of the network or data transmission rate of the network.

7. Using the idea of claim 5 and 6 to prioritize different customers by assigning proper weighting function to different customers in the performance index.
8. Using the idea of claim 1 and claim 2 and simplifying the optimization problem of claim 5, by searching between a subset of available lines, instead of all available lines, for assigning to DSL service.
9. The method of claim 8 can be implemented, by identifying a subset of lines which have relatively weak interaction.
10. Identifying a subset of weakly interacting lines in claim 9 can be accomplished via direct measurement such as using a spectrum analyzer, or any identification procedure.
11. Using the idea of claim 1 and claim 2 to solve the optimization problem by taking the crosscoupling strength between all lines and the DSL service-type of each customer into account.
12. Using the idea of claim 1 and claim 2 to solve the optimization problem of claim 5 in a general way and independently of the service-type of each customer by finding the lines with minimum crosscoupling norm.
13. The idea of claim 1 and 2 can be implemented by using the bridged-taps, which exist at different locations throughout the line.
14. The idea of claim 1 and claim 2 can be used to assign one line to more than two customers, if the line is known to have small interaction with other lines at specific bridged-tap locations throughout the line.
15. The idea of claim 1, claim 2 and claim 14 can be applied to one POTS customer and multiple DSL customers with distinct data frequency band.
16. Using the idea of claim 14, if a line is assigned to multiple customers, the ones who are closer to the CO will receive a faster DSL service.